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Protecting a Natural Resource Legacy While Promoting Resilience: Can It Be Done?

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I. INTRODUCTION

Our stock of natural resources, and the values and services they provide, are diminishing steadily over time.[1] We have dozens of laws, enacted over a period of almost forty years that express the objective of stemming this tide.[2] Yet, the inexorable, incremental loss continues.[3]

Scholars concerned with conservation of our natural capital have long wrestled with how best to improve the laws we have in place and to supplement the framework of existing law with newer approaches. One common theme in efforts to design progressive conservation law is how to better incorporate scientific insights into our legal regimes.[4]

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1. *See* WORLD WILDLIFE FUND ET AL., LIVING PLANET REPORT (2008), http://assets.panda.org/downloads/living_planet_report_2008.pdf; MILLENNIUM ECOSYSTEM ASSESSMENT, ECOSYSTEMS AND HUMAN WELL-BEING: BIODIVERSITY SYNTHESIS 2–5(2005), http://www.millenniumassessment.org/documents/document.354.aspx.pdf; MILLENNIUM ECOSYSTEM ASSESSMENT, ECOSYSTEMS AND HUMAN WELL-BEING: WETLANDS AND WATER SYNTHESIS 2–10 (2005), http://www.millenniumassessment.org/documents/document.358.aspx.pdf.
2. *See* Alyson C. Flournoy et al., *Harnessing the Power of Information to Protect Our Public Natural Resource Legacy*, 86 TEX. L. REV. 1575, 1575–76 (2008).
3. *See, e.g.*, Welfare Ranching: The Subsidized Destruction of the American West 162–257 (George Wuerthner & Mollie Matteson eds., 2002); NOAA's NATIONAL MARINE FISHERIES SERVICE REPORT ON THE STATUS OF THE U.S. FISHERIES FOR 2006, http://www.nmfs.noaa.gov/sfa/domes_fish/StatusoFisheries/2006/2006RTCFinal_Report.pdf; *see also* ALYSON FLOURNOY ET AL., SQUANDERING PUBLIC RESOURCES: A CENTER FOR PROGRESSIVE REFORM REPORT 2 (Sept. 2007), http://www.progressivereform.org/articles/Squandering_Public_Resources.pdf (arguing that "natural resources on many different types of public lands are being managed unsustainably, often contrary to stated goals, objectives, and legal mandates").
4. *See, e.g.*, Mary Jane Angelo, *Embracing Uncertainty, Complexity and Change: An Eco-pragmatic Reinvention of a First-Generation Environmental Law*, 33 ECOLOGY. L.Q. 105 (2006) (analyzing pesticide law through lens of eco-pragmatism as a way to incorporate ecology into law); Holly Doremus, *Scientific and Political Integrity in Environmental Policy*, 86 TEX. L. REV. 1601 (2008) (describing obstacles to scientific and political integrity in environmental law and policy making processes and how lapses in political integrity can undermine scientific integrity

This effort to reform existing law or design new laws that incorporate the insights of ecology confronts a central tension. Scholars differ in their assessment of the key failures in existing law, depending on whether they approach the question from a legal or scientific perspective. Those focused on the legal dimension frequently see the unmet challenge as designing effective and enforceable conservation laws with clear objectives. They often see the central failure as inadequate or ineffective constraints on private actions that degrade or deplete our resources.[5] On the other hand, those focused on the insights from science often point to the failure of legal regimes to provide agencies and land managers adequate flexibility to make scientifically sound decisions in light of our limited knowledge about the environment and the inevitability of change and surprises.[6]

These different perspectives create a fundamental tension that cannot be easily or generically resolved. In order to benefit from the

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of decision-making processes); Holly Doremus, *Precaution, Science, and Learning While Doing in Natural Resource Management*, 82 WASH. L. REV. 547 (2007) (describing how "learning while doing" approach provides a more accurate way to address the ongoing uncertainty that pervades natural resource management); Bradley C. Karkkainen, *Panarchy and Adaptive Change: Around the Loop and Back Again*, 7 MINN. J. L. SCI. & TECH. 59 (2005) (exploring Holling's concept of panarchy and its potential application in law); Bradley C. Karkkainen, *Collaborative Ecosystem Governance: Scale, Complexity, and Dynamism*, 21 VA. ENVTL. L.J. 189 (2002) (describing emerging model of collaborative ecosystem governance that incorporates an ecological perspective); Bradley C. Karkkainen, *Adaptive Ecosystem Management and Regulatory Penalty Defaults: Toward a Bounded Pragmatism*, 87 MINN. L. REV. 943 (2002) (exploring regulatory penalty defaults as a tool to address the challenges to incorporating adaptive management into environmental law); J.B. Ruhl & R. Juge Gregg, *Integrating Ecosystem Services into Environmental Law: A Case Study of Wetlands Mitigation Banking*, 20 STAN. ENVTL. L.J. 365 (2001) (exploring the use of ecosystem services to account for the value of ecological functions in wetlands mitigation banking); J.B. Ruhl, *Reconstructing the Wall of Virtue: Maxims for the Co-Evolution of Environmental Law and Environmental Science*, 37 ENVTL. L. 1063 (2007) (exploring how to better incorporate science by rejecting the effort to separate science and policy in favor of an effort to create transparent and credible processes for science and policy); J.B. Ruhl, *The Pardy-Ruhl Dialogue on Ecosystem Management, Part IV: Narrowing and Sharpening the Questions*, 24 PACE ENVTL. L. REV. 25 (2007) (defending ecosystem management approach to natural resource management).

5. *See infra* Part II.

6. *See supra* note 4; *see also* Lance Gunderson, *Resilience, Flexibility and Adaptive Management—Antidotes for Spurious Certitude?*, 3 CONSERVATION ECOLOGY 7 (1999), http://www.consecol.org/vol3/iss1/art7/ (arguing that "successes and failures of [Adaptive Environmental Assessment and Management] are intertwined with system properties of flexibility and resilience"); C. S. Holling, *Resilience and Stability of Ecological Systems*, 4 ANN. REV. ECOLOGY & SYSTEMATICS 1 (1973) (developing the concept of ecological resilience); J.B. Ruhl, *Taking Adaptive Management Seriously: A Case Study of the Endangered Species Act*, 52 U. KAN. L. REV. 1249 (2004) (considering whether administrative reform has transformed the Endangered Species Act sufficiently for its implementation to be considered eco-pragmatic).

insights of both law and science, reform efforts must heed both perspectives. Taken together, the two perspectives call for legal regimes that are enforceable, achieve clear results, and yet permit flexibility in their implementation—a seeming oxymoron.

This Article explores whether, how, and to what extent these two goals can be reconciled. It employs a single example—a proposal for a new federal statute—to examine whether and how the tension can be addressed in the design of that particular statute.

The statutory proposal that is the focus of this inquiry was developed in response to the ongoing loss of public natural resources and their associated services and values. This proposal for a new statute, called the National Environmental Legacy Act ("Legacy Act" or "NELA") was crafted primarily from a legal perspective. The central shortcomings it is designed to remedy are the lack of meaningful long-term conservation goals for public natural resources and the lack of associated enforceable constraints on our depletion and degradation of these resources. Its core objective is therefore to complement existing laws with a mandate that is enforceable and achieves clear conservation objectives.

The purpose of this Article is to evaluate the extent to which the design of this proposed statute is or can be made consistent with the insights of ecology. In keeping with the opportunity presented by this symposium, the Article examines how the ecological concept of resilience can help us to resolve this central tension in environmental law and policy. It identifies the points of tension between the proposed statute and the lessons ecologists offer about natural resource use and management and then explores how the concept of resilience may help to address this tension.

In Part II, the Article summarizes some critiques from a legal perspective of the existing laws that seek to protect our public natural resources. Part III describes the proposal for a National Environmental Legacy Act, an idea that emerged in response to this formulation of the problem. Part IV introduces resilience and related ecological concepts and elaborates on the tension between natural resource laws and the insights these concepts suggest. Part V evaluates the extent to which the proposed design of the Legacy Act is consistent with the insights from ecology and the extent to which it stands in tension with them. Having identified points of tension, it explores how the concept of resilience in particular may provide a useful tool to address this central tension and improve the proposed statutory design.

II. SHORTCOMINGS IN EXISTING LAW

A survey of the statutes governing management of our public natural resources reveals a clear and often expressed commitment to protect these resources for the long-term use of both present and future

generations of Americans. The commitment to sustainability and to the interests of future generations is pervasive in our conservation laws.[7] Many public and nongovernmental reports detail the threats to and diminishing quality and quantity of our public natural resources.[8] The steady stream of reports documenting the ongoing degradation and depletion of these resources thus raises the question why, despite our stated commitment to sustainable use of resources and intergenerational equity, we continue to impair our stock of natural capital.[9]

Squandering Public Resources, a recent report from the Center for Progressive Reform, sought to identify the underlying statutory and administrative deficiencies that contribute to these shortfalls.[10] It surveyed how the implementation of laws with stated conservation goals was undermining achievement of conservation objectives.[11] The report catalogued some common reasons why the laws or their implementation fell short: inadequate or unenforceable legal standards, inadequate monitoring and enforcement, limits on public participation, exemptions precluding environmental review, inadequate funding, and inadequately justified subsidies for degradation or depletion of resources.[12]

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7. *See* Flournoy et al., *supra* note 2, at 1575–76 nn.2–3 (listing nineteen statutory provisions that identify either sustainable use of natural resources or protecting the interests of future generations as objectives).
8. *See supra* note 3.
9. One answer to the question is to dismiss the legislative language as merely symbolic. *See* John P. Dwyer, *The Pathology of Symbolic Legislation*, 17 ECOLOGY L.Q. 233 (1990). However, given the pervasive repetition of this commitment, this does not provide an adequate explanation. Moreover, even if it is symbolic, I would argue that such a fundamental dissonance between our stated goals and our actions warrants public attention and resolution.
10. FLOURNOY ET AL., *supra* note 3. This report and the critiques summarized below are only a partial legal perspective on the shortcomings of existing law. There is a wide array of diagnoses of the problems and recommendations for solutions. For example, there are critiques from very different but also law-based perspectives that identify federal ownership of land as the problem and propose greater private ownership of these lands as the solution. TERRY ANDERSON & DONALD LEAL, FREE MARKET ENVIRONMENTALISM 37–46 (2001) (using case studies to argue that private ownership of lands is more efficient at producing optimal levels of goods, services and amenities desired by the public).
11. The report focused on laws governing lands under BLM management, National Forests, National Parks, National Wildlife Refuges, and the purchase and disposition of lands under the Land and Water Conservation Fund. When viewed through the lens of law, the shortcomings in the existing legal regimes include flaws in design and implementation, as well as inadequate funding. Thus, changes in legislative design, in administrative execution of the laws, and in legislative funding approaches may be required to rectify the shortcomings. This Article focuses particularly on changes in legislative design that may promote better execution of the law.
12. *See also* Robert L. Glicksman, *Ecosystem Resilience to Disruptions Linked to Global Climate Change: An Adaptive Approach to Federal Land Management*, 87

A brief review of the report's findings on each of these topics provides insight into the need for effective and enforceable conservation laws with clear objectives.

A. Inadequate or Unenforceable Standards

Many of our federal public lands and the resources and values associated with them are subject to commands for multiple use and sustained yield. The Federal Land Policy and Management Act ("FLPMA")[13] and Multiple-Use, Sustained-Yield Act ("MUSYA")[14] mandate that relevant federal lands be managed for a wide array of uses to meet the needs of the American people, so as to maintain the output of the resources *in perpetuity*.[15] The National Forest Management Act ("NFMA") declares that the National Forest System is "dedicated to the long-term benefit for present and future generations."[16]

FLPMA defines "multiple use" to mean that the lands and their various resource values are to be utilized "in the combination that will best meet the present *and future* needs of the American people."[17] "Multiple use" also requires "a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources, including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic, scientific and historical values."[18]

MUSYA also specifies that this multiple use is to be without impairment of the productivity of the land.[19] Both statutes require the land management agency to consider a wide array of resources and services and not necessarily seek to achieve the greatest dollar return or output.[20]

These statutes articulate a general mandate for federal agencies to consider the interest of future generations and the sustainability of uses of the resources on these federal lands. However, inherent in the mandate for multiple uses is a requirement that the agencies reconcile

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NEB. L. REV. (2009) (assessing "the capability of the federal land management agencies under current law to deal with climate change and the threats it poses to federal lands and resources and to protect the incalculable value they contribute to society").

13. 43 U.S.C. § 1701 (2000).
14. 16 U.S.C. §§ 528–531 (2006).
15. *Id.* § 531(b) (MUSYA definition of sustained yield); 43 U.S.C. § 1702(h) (FLPMA definition of sustained yield); 43 U.S.C. § 1732(a) (FLPMA mandate that lands be managed pursuant to principles of multiple use and sustained yield).
16. 16 U.S.C. § 1609(a).
17. 43 U.S.C. § 1702(c) (emphasis supplied).
18. *Id.*
19. 16 U.S.C. § 531(b) (definition of sustained yield).
20. *Id.* § 531(a) (MUSYA definition of multiple use); 43 U.S.C. §1702 (c) (FLPMA definition of multiple use).

a variety of uses, some of which inherently degrade values associated with the resource and prevent some present and future uses. While aspiring to preserve all resources and values, Congress has authorized some uses that will degrade others permanently and irretrievably. So, if an agency allows some authorized uses, it will inevitably preclude preserving the option of other uses in the future. For example, permitting oil and gas exploration may degrade or destroy wildlife habitat and interfere with natural scenic, historical, and watershed values permanently. The statutes lack explicit instructions on how to resolve this tension.[21]

Because of the unresolved tension in these mandates, the implementing agencies must interpret the language and make choices. The ambiguity affords the agencies considerable discretion to implement the interpretations they choose, subject only to the clear limits expressed in the statute. Congress's failure to resolve this tension and clearly articulate defined objectives for resource management has certain long-observed effects. The lack of a strong, unambiguous statutory mandate, when coupled with well-funded pressure from industries that have an economic incentive to exploit resources for profit, has led agencies to make decisions that produce degradation and depletion of resources clearly in conflict with the general mandates for multiple use and sustained yield.[22]

The shortcomings of the statutes could have been overcome by agency interpretations and regulations that imposed enforceable constraints to ensure that public and private actions do not impair the resources' sustainability. And indeed, one reading of the statutes would suggest that such standards were required. However, agencies have instead declined to articulate such standards and have failed to impose adequate enforceable restrictions.[23]

Looking beyond the statutes specifically governing our federal lands, the National Environmental Policy Act ("NEPA")[24]—the grande dame of environmental statutes that applies to many decisions affecting public natural resources—similarly fails to mandate decisions that will conserve resources for future generations. Courts have

21. *See* FLOURNOY ET AL., *supra* note 3, at 18.

22. *See id.* at 8–9 (describing ecological degradation of BLM-managed grazing lands), 13, 14, 17–18 (degradation from energy development on BLM-managed lands); Glicksman, *supra* note 12 (describing agencies' records of failure to consider long-term threats to resources notwithstanding specific mandates to do so).

23. *See* FLOURNOY ET AL., *supra* note 3, at 12 (describing BLM grazing regulations' shortcomings), 19 (describing BLM's failure to mandate use of environmentally benign techniques for energy development and merely encouraging but not requiring use of BMPs); Glicksman, *supra* note 12 (describing Forest Service implementation undermining statutory biodiversity preservation mandate).

24. 42 U.S.C. § 4321 (2000).

long interpreted NEPA to require only consideration of environmental impacts and alternatives and documentation of that consideration.[25]

Judicial decisions interpreting public land management statutes have dealt further blows to any chance for enforceable conservation mandates. In *Ohio Forestry Association v. Sierra Club*,[26] the U.S. Supreme Court applied the ripeness doctrine to a petition for review of a Bureau of Land Management ("BLM") Land Resource Management Plan ("LRMP") and held that LRMPs are not justiciable. Thus, any challenge must be brought to individual site-specific actions, such as logging permits, rather than to an overall plan that either permits or mandates impairment of sustainability or actions inconsistent with multiple use. *Norton v. Southern Utah Wilderness Alliance*[27] further eroded the enforceability of agency plans, holding that the commitments in LRMPs are not legally binding, enforceable commitments. Thus, plaintiffs cannot bring challenges to agency failures to undertake conservation-oriented actions promised in these plans.[28]

Even public lands managed under dominant use standards that clearly require agencies to favor conservation are not immune from administrative actions that threaten to undermine conservation. The National Park Service ("NPS") Organic Act includes a clear statement that the national parks' purpose is "to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."[29] Yet under the George W. Bush Administration, recent administrative proposals were described as threatening to "shift the management focus from the park service's central mission—preserving natural resources for the enjoyment of future generations—to commercial and recreational use of the park for today's generation."[30] Although these efforts failed after meeting with public outcry, one proposal would have revised NPS policies to omit key language from the NPS Organic Act—the phrase that provides that in case of a conflict between conservation of resources and values and present enjoyment, conservation is to be predominant.[31]

Similarly, notwithstanding the National Wildlife Refuge System Improvement Act of 1997 and its strong mandate that national wildlife refuges be managed for conservation for the benefit of present and

25. Strycker's Bay Neighborhood Council, Inc. v. Karlen, 444 U.S. 223 (1980).
26. 523 U.S. 726 (1998).
27. 542 U.S. 55 (2004).
28. *Id.* at 71–72.
29. 16 U.S.C. § 1 (2006).
30. *See* FLOURNOY ET AL., *supra* note 3, at 31 (quoting Editorial, *Crossroad in the National Parks*, N.Y. TIMES, Feb. 27, 2006, at A18).
31. *See id.*

future generations of Americans,[32] recent administrative policies have threatened to undermine this dominant objective by creating greater opportunities for states to influence management without public review.[33]

B. Lack of Monitoring and Enforcement / Underfunding

A suite of related shortcomings in the implementation of our conservation laws as implemented includes insufficient monitoring, enforcement, and funding. Monitoring is needed both to assess the status of natural resources, to determine the impact of permitted activities on the resources, and to ensure that permitted actions are taken in accordance with all applicable requirements. Sadly, monitoring of all three types is lacking.[34] The failure of agencies to undertake sufficient monitoring of the quality and quantity of resources under their management is closely linked to the problem of inadequate funding for resource management agencies. The lack of monitoring often reflects both the absence of a statutory mandate (as opposed to mere authorization) for monitoring of resources and the activities affecting them and underfunding of agencies that leaves them with inadequate personnel to conduct needed monitoring. Both a mandate and funding are required to ensure adequate monitoring.

Closely linked to the lack of monitoring is the lack of enforcement. Enforcement is by definition a highly discretionary activity over which the agencies have considerable leeway. But where staffing is short and monitoring is absent, the choice whether to enforce is made by default. Little or no enforcement occurs, as has been the case in recent years.[35]

Apart from monitoring and enforcement, inadequate funding has compromised agencies' ability to conserve resources for future generations. Budget cuts have hurt the National Park Service's ability to ensure the preservation of core park values.[36] Similarly, budget shortfalls have impaired the National Wildlife Refuges' abilities to preserve habitat by controlling non-native invasive species.[37]

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32. 16 U.S.C. § 668dd(a)(2).

33. *See* FLOURNOY ET AL., *supra* note 3, at 36–37.

34. *See id.* at 12–13 (inadequate monitoring of lands on which grazing occurs), 19–20 (lack of staffing to monitor permitted energy development activities and mandatory reclamation activities).

35. *See id.* at 19–20 (energy development reclamation requirements poorly enforced).

36. *See id.* at 27–29.

37. *See id.* at 38.

C. Limits on Public Participation / Exemptions Precluding Environmental Review

Another phenomenon noted in the report is the trend to limit public participation in decisions affecting public natural resources. Recently revised BLM regulations[38] as well as Forest Service planning rules[39] are prime examples of this trend under the George W. Bush Administration. Many of these initiatives have taken the form of creating exemptions to compliance with NEPA, thus eliminating one important avenue for public information and input.[40]

D. Inadequately Justified Subsidies

A final theme in the report is the inadequately examined and justified subsidies that these laws promote or permit. Grazing activities accrue tremendous gains to a small number of citizens.[41] The profits for those in energy development are well-documented, and permission to extract energy resources from federal lands has subsidized this already highly-profitable activity.[42] Harvest of timber from federal lands, and mineral extraction[43] are two other areas where subsidies warrant closer examination.

In sum, an analysis of our current laws governing conservation of public natural resources from a legal perspective reveals a series of flaws that impair the laws' enforceability and their efficacy in achieving stated conservation goals. While conservation *could* be achieved under the mandates of many of the laws, the ongoing depletion of resources is a product of laws that are not equal to the pressure applied by economic interests that seek to profit from current exploitation of public natural resources. Viewed from this perspective, if we wish to truly preserve a legacy of public natural resources for future generations, law reform must focus on ensuring that our conservation laws possess adequate enforceable standards, monitoring, enforcement, funding, and opportunities for public participation.

III. THE IDEA FOR A NATIONAL ENVIRONMENTAL LEGACY ACT

The idea for a National Environmental Legacy Act was born out of frustration with the inadequacies catalogued above. Despite a pano-

38. *See id.* at 12–13.
39. *See id.* at 21, 22, 25.
40. *See id.* at 25–27.
41. *See id.* at 8.
42. *See id.* at 20.
43. Although a moratorium on patenting mineral claims is in place, there was an attempt to lift the moratorium several years back, without public debate over the justification for such a subsidy. *See id.* at 7–8.

ply of conservation-oriented laws with mandates that seem to dictate consideration of long-term sustainability in decisions affecting our public lands and the resources on them, the record of degradation and depletion is clear, and the shortcomings in our laws are fairly apparent. And although there are periodic calls to strengthen existing laws, the political risk associated with opening existing laws to legislative amendment has led to a stalemate that precludes not only reform, but even reauthorization of existing laws.[44]

The concept underlying a Legacy Act is to define and protect a legacy of public natural resources[45] for future generations, something no statute has done successfully to date. Building on the goals already expressed in numerous laws, NELA would for the first time require management of public resources to conserve some stock of resources for future generations. Embrace of the Legacy Act concept would impel us to identify our long-term goals and then help us to chart and maintain a course to achieve our shared goals. It would also improve our decisions over the long term by generating the information base needed to support adaptive learning.

At a minimum, the idea of a Legacy Act envisions a statute that defines the public natural resource legacy we wish to preserve and prohibits all actions that will degrade or deplete the defined legacy. These two core objectives of the statute are guideposts that suggest the general contours of the statute. Building on these objectives, my co-authors and I have proposed the following model to achieve the goals of the statute.[46]

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44. *See* CTR. FOR PROGRESSIVE REFORM, CPR FOR THE ENVIRONMENT: BREATHING NEW LIFE INTO THE NATION'S MAJOR ENVIRONMENTAL STATUTES 1 (Alyson Flournoy & Matthew Shudtz eds., 2007), http://www.progressivereform.org/articles/CPR_701.pdf.

45. For purposes of discussion, I propose a very broad definition of public natural resources that includes all resources under federal ownership or protected by the federal public trust doctrine, together with all the values and services associated with these resources. Thus this would include forests, wetlands, grasslands and other uplands on public lands and all the species of life found in these ecosystems, as well as fisheries under federal protection or control. Minerals encompassing an array of hard-rock minerals as well as oil, gas, and other energy resources would also be covered. The values and services these resources provide to humans are numerous and varied. For example lands within a National Forest may provide timber for consumptive use, habitat for wildlife, carbon sequestration, watershed and erosion protection, aesthetic, spiritual, and recreational values, to name a few.

46. To design the statute will require both considerable technical work and further elaboration of value choices. This sketch of the statute's contours includes section numbers for ease of reference. However, it is intended as a sketch of the contours of a Legacy Act, not a detailed statutory proposal. This description of the Legacy Act is substantially drawn from Flournoy et al., *supra* note 2, at 1587–90.

- *Section 1—Goals and Policy*: The statute should set out the goal of defining and preserving a legacy of public natural resources for present and future generations of Americans. The statement of goals and policy should also describe in affirmative terms the legacy we wish to leave, defined in relation to our existing stock of resources.
- *Section 2—Designation of a Legacy Period*: The statute should designate a fixed period of years that constitutes the legacy period, over which public natural resources must be conserved.[47]
- *Section 3—Prohibited Degradation or Depletion of Legacy Resources*: The statute should set forth in clear and enforceable terms the maximum degree of degradation or depletion of resources that will be permitted over the course of the legacy period, if any. This is critical to ensure the enforceability of the statute. The statute should be designed to accommodate distinct standards of permissible depletion or degradation for mineral and biological resources. The statute should in broad terms prohibit actions by any person[48] that may cause impermissible degradation or depletion of a legacy resource—that is, degradation or depletion that exceeds the relevant substantive standard over the legacy period.
- *Section 4—Designation of Legacy Resource Stewardship Agencies*: The statute should designate an existing federal agency to serve as the resource stewardship agency ("stewardship agency") for each public natural resource.[49]
- *Section 5—Development of Metrics and Collection of Baseline Data on Resource Quality and Quantity*: Each stewardship agency should be charged to develop implementing regulations that designate appropriate metrics of quality and quantity for the resources for which they are stewards. The statute should both mandate and authorize adequate funding for collection of baseline data on the quality and quantity of all public natural resources employing these metrics.

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47. To achieve a truly long-term perspective and overcome the power of short-term interests would suggest a period that is in the range of twenty to fifty years. At the conclusion of each legacy period, a new legacy period would commence.

48. The term should be very broadly defined to include all public and private actors. *See, e.g.*, 16 U.S.C. § 1532(13) (2006). The statute should make clear that the prohibition on actions that impermissibly degrade or deplete legacy resources applies both to private actors and to agencies whose actions affect the relevant resource—including management, permitting, and leasing of the resource.

49. Where an agency has stewardship responsibilities for a particular resource under existing law, it would seem most efficient to designate that agency for this role, unless past experience suggests that this would be inconsistent with achieving the purposes of the Act.

- *Section 6—Promulgation of Rules Defining Maximum Permitted Levels of Degradation and Depletion Over the Legacy Period*: Each stewardship agency should be required to promulgate rules that translate the substantive prohibition of section 3 into enforceable standards expressed in terms of the metrics developed under section 5 for relevant resources.
- *Section 7—Stewardship Agency Mandate to Ensure No Impermissible Degradation Will Occur (Prohibition and Planning)*: The statute should limit stewardship agencies' discretion under existing law by requiring that each stewardship agency ensure that no degradation or depletion in excess of permissible limits will occur during the legacy period. The statute should also specifically mandate that each stewardship agency develop a "legacy plan" to demonstrate how it will ensure that the mandated resource legacy is conserved over the legacy period and to conform its actions to the legacy plan.[50]
- *Section 8—Enforcement*: To ensure enforcement, both the agency and citizens should be granted enforcement authority. A citizen suit provision with fee-shifting would be a critical component of the statute. It should authorize any person to bring an action to enjoin and seek penalties for any action that impermissibly degrades or depletes public natural resources. The statute should also permit citizen suits against the stewardship agency to enforce other agency duties under the statute, including the duty to collect information, the duty to develop or update a legacy plan, and the duty to conform agency actions to the terms of the legacy plan.
- *Section 9—Monitoring and Adaptive Learning*: The statute should require and authorize funding for ongoing monitoring of legacy resources by stewardship agencies and should require stewardship agencies to update legacy plans according to a fixed schedule.
- *Section 10—Exceptions*: The statute should allow for a narrow exception to its prohibition on degradation or depletion in two circumstances: if it can be shown by clear and convincing evidence that (1) foreseeable technological advances or the availability of substitute resources will obviate the need for and value of the resource in question; or (2) impermissible degradation or depletion is clearly in the public interest, no acceptable alternative that will not cause impermissible degradation or depletion exists that will serve the public interest adequately, and the

50. For those agencies that already undertake planning regarding the relevant resource, this duty should be coordinated with the agencies' planning duties under existing enabling acts.

impacts to all services and values to be impaired can and will be mitigated.

A. How the Legacy Act Responds to the Legal Critique of Existing Conservation Law

The proposed Legacy Act seeks to respond to several of the key impediments to effective conservation law identified in Part II. First, in sections 1, 3, and 6, the statute seeks to force a clearer statement of conservation objectives than is found in most current conservation laws. Section 1 demands that Congress articulate in affirmative terms the legacy of public natural resources we wish to conserve. Section 3 then requires that Congress clearly articulate a standard of how much depletion or degradation can be permitted if we are to achieve that legacy. It also makes this standard enforceable, prohibiting any action that will exceed the permitted level of depletion or degradation. Section 6 guides implementation of this standard, by requiring the stewardship agency to translate these standards into metrics that can be monitored. Section 7 ensures enforcement of these mandates by affirmatively requiring the agency to ensure that no degradation or depletion in excess of permissible limits will occur and mandating that agencies develop plans to ensure compliance.

The Legacy Act responds to the problem of lack of monitoring and enforcement by mandating monitoring in sections 5 and 9, and employing the concept of metrics to alleviate the massive data demands that monitoring of all resources would entail.[51] Section 8 authorizes citizen enforcement against parties (including stewardship agencies) who breach a duty under the Act, in addition to granting stewardship agencies enforcement authority. Section 8 also makes Legacy Plans enforceable, in an effort to distinguish them from LRMPs and other plans that have been held by courts to be non-enforceable.

As presently conceived, the Legacy Act does not provide a clear solution to executive and legislative actions that starve agencies of funding. The challenge with assuring adequate funding is the fact that Congress must act to appropriate funds and therefore can always override its past decisions. Even the trust fund approach used in the

51. The concept of metrics is taken from Sidney A. Shapiro & Rena Steinzor, *Capture, Accountability, and Regulatory Metrics*, 86 TEX. L. REV. 1741 (2008). Shapiro and Steinzor define metrics as standards of measurement and emphasize that they should be short and concise, selected by an independent body of experts, focused on outcomes not outputs, changed to reflect progress and spur advances, and diagnostic. *Id.* at 1770. They develop the concept in the context of designing metrics for agency accountability, but it seems to have great potential value in the Legacy Act context as well.

Land and Water Conservation Fund Act of 1964 has proven to be of limited success.[52]

The Legacy Act envisions public participation in the important regulatory actions required under sections 4 and 5 and also in the Legacy Plan development process under section 7. Coupled with the citizen enforcement provision that provides a cause of action to challenge activities that will cause impermissible degradation, this should enable broad public involvement.

Finally, the statute should override decisions to authorize heavily subsidized activity in those cases where the subsidies are causing us to deplete or degrade a legacy resource we otherwise wish to preserve. Thus, although the grazing laws may encourage parties to graze their livestock on public lands through a generous subsidy, if grazing activities are causing impermissible depletion or degradation of public natural resources, the activity would not be permitted. Because the Legacy Act modifies and supersedes agency mandates under existing law, it offsets the undesirable effect of any subsidy, to the extent the subsidy conflicts with our legacy objectives.

B. Articulating the Central Substantive Standard

A pervasive weakness identified in our existing resource management and conservation laws is Congress's conflicting messages: its general commitment to sustainability and the interests of future generations coupled with the apparent grant of discretion to the agencies to consider and juggle the interests of present and future generations to use the resources in ways that may impair future generations' interests in sustainability.

The Legacy Act seeks to address this weakness by specifically making paramount the interest in preserving resources of some quantity and quality for the future. In order to accomplish this, Congress must provide clear and enforceable guidance on the amount of degradation and depletion of public natural resources that will be allowed over the legacy period. Thus, having Congress articulate in the statute our goals in terms of the legacy that we leave (section 1), and the level of resource degradation and depletion that is prohibited (section 3), is a key element in the design of the Legacy Act. These are central value choices that can only be validly made through the democratic legislative process and are therefore not spelled out in the description of the statute. Ideally, the statute would be informed by broad, educated

52. *See* FLOURNOY ET AL., *supra* note 3, at 39–41 (cataloging Congress's failure to appropriate authorized funds from the trust fund and allowing unspent funds to return to the general treasury for non-conservation uses). An amendment designed to address this problem was introduced but failed. *Id.* Its approach may offer promise for future enactments and could be incorporated into a Legacy Act.

public debate on the values at issue and the various options open to us.[53]

For purposes of discussion, I offer below an illustration of goals and standards that could be adopted in sections 1 and 3 of the statute, adopting a conservative standard that seeks to preserve resources equivalent in quantity and quality to those existing today, subject only to de minimis reduction. This illustration is not intended to suggest that this is in any sense the correct standard. It merely serves to illustrate how the statute would operate and to highlight the tensions between the statute as designed and the insights from science.

1. Illustration

- *Section 1—Goals and Policy*: The goal of this statute is to preserve a legacy of public natural resources of equivalent quantity and quality as exist today, as measured under section 5 (baseline data).
- *Section 3—Prohibited Degradation or Depletion of Legacy Resources*: All activities that are likely to result in any depletion or degradation of public natural resources at the conclusion of the legacy period (except for de minimis degradation or depletion) shall be prohibited.

IV. RESILIENCE, CHANGE, AND UNCERTAINTY: THE TENSION BETWEEN NATURAL RESOURCE MANAGEMENT LAWS AND ECOLOGICAL INSIGHTS

Part III set out the concept of the Legacy Act and described how this statute responds directly to some major critiques of existing conservation laws from one legal perspective. This Part introduces the

53. The options cover a broad range. A very conservative option would be to articulate in section 1 a goal of retaining resources of identical quality and quantity as those we have today, at the end of whatever legacy period is selected, or even to demand that we improve the quality of those resources and allow regeneration of renewable resources that will increase the quantity. Either of these would reflect an extremely strong commitment to sustainability and intergenerational equity. The associated prohibition in section 3 would prohibit all degradation and depletion of resources beyond the resources' demonstrated renewal capacity.
The most liberal option would undermine the very purpose of adopting a Legacy Act. This would be to articulate no goal in section 1 and under section 3 not to prohibit any degree of degradation and depletion of resources. This would reflect a commitment to the interests of the present generation and what could be called a "spend-down ethic". While we do not explicitly embrace such an ethic, it is possible that we are in practice pursuing this course today. Our current statutes fail to impose any ultimate cap on resource degradation or depletion and permit open-ended balancing of various interests. Although the cumulative effect of incremental decision-making is hard to predict, the absence of enforceable limits coupled with broad agency discretion to allow degrading and depleting uses could lead to absolute degradation or depletion of resources.

concept of resilience and associated insights about change in and uncertainty about natural systems. It notes the areas of tension between these concepts and the statute described in Part III, which was designed primarily from a legal perspective.

A. Resilience

The focus of this symposium is the ecological concept of resilience and its potential to inform the design of a new generation of environmental law and policy. C.S. Holling developed the concept of ecological resilience as a way to describe the "persistence of relationships within a system and . . . a measure of the ability of these systems to absorb changes" and still persist.[54] Thus it can help us to describe the degree of disturbance a system can tolerate before it flips into another behavior regime.[55] Resilience expresses the ability of a system to rebound from disturbance and the point at which a disturbance triggers a shift in the structure of the system.[56]

Thus, resilience helps us to understand the implications of change for natural systems and the inevitable uncertainty that characterizes our understanding of these systems. The concept of resilience enables us to step back from the realities of change, uncertainty, and the dynamic nature of ecosystems to focus on what might be called the degree of play in a given system—how the system responds to perturbation. While resilience is therefore an important and useful concept, natural resource management laws to date have not been designed to consider how to manage natural systems to maintain their resilience. Rather, most natural resource management laws define one or more objectives for the resource.[57] In theory, the implementing regulations under these statutes are designed to channel human conduct so that the objectives are achieved.[58] To the extent our laws fall short, the shortfall can often be linked to the failure to adequately define the goal or to impose adequate legal constraints to ensure that all decisions and actions affecting the resource move us toward the goal or objective. Viewed from this perspective, the first thing our natural resource management laws need is better defined and more enforceable goals or objectives. Yet the concept of resilience and the

54. Holling, *supra* note 6, at 17.
55. *See, e.g.*, Gunderson, *supra* note 6.
56. *Id.*
57. *See e.g.*, 43 U.S.C. § 1702(c) (2000); 16 U.S.C. § 531 (2006) (discussed *supra* Part II.A).
58. In general, activity taken or permitted under these statutes is to be consistent with stated goals of the statute and with agency land or resource management plans prepared pursuant to the statute. *See, e.g.*, 16 U.S.C. § 1604(e) (requiring that Forest Service forest management plans achieve goals of multiple use and sustained yield); 16 U.S.C. § 1604(i) (requiring that actions, permits, contracts and other instruments be consistent with land management plans).

related insights about change, uncertainty and surprise suggest that this model is flawed.

B. Change and Surprise

One recurring problem for conservation laws that follow this model is defining objectives in a changing environment about which our knowledge is limited. The classic approach of defining fixed objectives for natural resources stands in tension with the reality that natural systems are dynamic.[59] The metaphor of ecosystems as systems that maintain a balance has long been superseded by a vision of ecosystems as dynamic and capable of existing in various different stability domains. Surprises, ecology tells us, are the rule, not the exception.[60] Thus the question is how to determine what our target or objective should be in a world of change and surprise.

This question is already being addressed by ongoing efforts to design legal regimes that incorporate adaptive management, an approach to managing natural systems that incorporates experimentation and flexible management as tools to reduce uncertainty and achieve optimal decisions. In adaptive management, decisions are viewed as experiments, the results of which are monitored. Future decisions and actions (which themselves serve as further experiments) then incorporate the learning from monitoring the earlier experiments. Laws that incorporate adaptive management include conscious experimentation and mechanisms for feedback, and changes in resource management based on what is learned.[61]

While this approach has great promise, the discretion and flexibility essential to an adaptive management approach can create a deficit of enforceability if not carefully designed. As Lance Gunderson points out, if there is no resilience in the ecosystem or if the stakeholders in the associated social system are inflexible, adaptive management will fail.[62] Flexibility is critical. Thus, the central tension between enforceability and flexibility remains a central challenge in the design of conservation laws.

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59. Steward T.A. Pickett et al., *The New Paradigm in Ecology: Implications for Conservation Biology Above the Species Level*, *in* CONSERVATION BIOLOGY: THE THEORY AND PRACTICE OF NATURE CONSERVATION, PRESERVATION AND MANAGEMENT 65 (Peggy L. Fiedler & Subodh K. Jain eds., 1992).

60. Gunderson, *supra* note 6, at 2.

61. Fred Bosselman, *A Role for State Planning: Intergenerational Equity and Adaptive Management*, 12 U. FLA. J.L. & PUB. POL'Y 311 (2001); John H. Davidson & Thomas Earl Geu, *The Missouri River and Adaptive Management: Protecting Ecological Function and Legal Process*, 80 NEB. L. REV. 816 (2001); Gunderson, *supra* note 6; Karkkainnen, *supra* note 4; Ruhl, *supra* note 6; J.B. Ruhl, *Regulation by Adaptive Management—Is it Possible?*, 7 MINN. J. L. SCI. & TECH. 21 (2005).

62. Gunderson, *supra* note 6, at 2, 6.

C. Uncertainty

Beyond the reality of change and surprise, uncertainty poses broader challenges for the design of law and policy. Because our knowledge about ecosystems is limited, we do not even have complete information about the *present* status of the resources we are trying to protect or conserve. So, even if we successfully articulate a desired state for the resources in question as an objective in a statute, we often do not actually know how far we are from achieving our objective or how much change can be tolerated before we will deviate from the objective.

Again, adaptive management represents one of the most promising approaches to mediating this tension. Adaptive approaches are consciously designed both to enable learning, thus reducing uncertainty, and to allow resource managers to adjust their management strategies in light of what they learn. However, the greater the flexibility afforded, the greater the risk that overarching goals or objectives will be sacrificed.

Thus, the challenge traditional natural resource management laws encounter could be summarized as follows: any ecosystem or natural resource for which we choose an objective or target is changing; we are unlikely to have complete information on the present status of the resource in relation to the target; and if we design a management strategy, change and surprise preclude accurate prediction of whether the strategy will achieve our objectives. This means that statutes that rely on a simple model of articulating objectives and seeking to achieve them through planning do not fully account for the challenges that natural resource management presents. Articulating objectives and goals, developing plans, and then mandating that decisions affecting the resource will ensure achievement of the objectives are therefore almost certain to fail.

V. EVALUATING THE LEGACY ACT FROM AN ECOLOGICAL PERSPECTIVE

When evaluated in light of the insights discussed in Part IV above, the proposed Legacy Act presents a mixed record. It contains several elements that seem to promote adaptive management. It mandates collection of data, ongoing monitoring, and incorporation of monitoring data into future decision making. It also promotes transparency and public participation and seeks to promote the use of the best available analytic tools. But in the quest to articulate a clear and enforceable mandate, it also contains a rigidity that is at odds with what ecology suggests natural resource managers need. Further, ecology highlights the challenge presented by the central feature of the Legacy Act: its expansion of the time horizon over which we seek to pre-

serve resources. It thus requires us to predict the future state of ecosystems over a longer time horizon than does current law. Also, the Act is designed to focus on individual *resources* rather than *ecosystems*. Yet ecology is premised on the interdependence of components of ecosystems and the long-term folly of seeking to manage individual resources independently. Each of these strengths and weaknesses will be briefly examined followed by some thoughts suggesting that the concept of resilience may hold the key to overcoming the tensions between the Legacy Act and the insights offered by ecology.

A. How the Legacy Act Is Consistent with Ecological Insights

1. *Filling Data Gaps*

Scientists have long lamented the huge gaps in the available data about natural resources on public lands.[63] The Legacy Act seeks to address this problem by mandating collection of baseline information about the many public natural resources in section 5. In addition, section 9 requires ongoing data collection to ensure that current information is maintained. A problem this poses is the sheer volume of data that could be collected and the inevitably limited resources that this task will receive. The introduction of the concept of metrics in section 5 is designed to address this concern. Building on an idea developed by Professors Shapiro and Steinzor in the context of agency accountability, we propose that agencies work to develop appropriate metrics that can serve as stand-ins for complete information about individual resources. This concept is merely a sketch at present, and it is possible that the work being done to study resilience could inform the effort to design metrics of the status of natural resources. For example, perhaps the selection of metrics could focus on indicators that provide us useful information not just about one resource but about the resilience of the natural system of which the resource forms a part.[64]

2. *Learning from Experience*

Another key lesson from the literature on adaptive management is the critical importance of learning: gathering information through experimentation and then adjusting behavior in light of the information. As outlined, the Legacy Act requires ongoing monitoring of public natural resources and updating of legacy plans in light of new informa-

63. *See* Holly Doremus, *Data Gaps in Natural Resource Management: Sniffing for Leaks Along the Information Pipeline*, 83 IND. L.J. 407 (2008); Frederic H. Wagner, *Whatever Happened to the National Biological Survey?*, 49 BIOSCIENCE 219, 219 (1999).

64. *See* Craig R. Allen et al., *Panarchy, Adaptive Management and Governance: Sustainable Policy Options for Building Resilience*, 87 NEB. L. REV. (2009).

tion. This is designed to permit adaptive management and adjustment of goals as appropriate in light of results.[65]

Another provision that could be viewed as promoting adaptive learning is section 10, the exception provision. The exceptions in section 10 allow the agency to deviate from mandatory preservation of the designated legacy when technological developments or a demonstrable change in the need for the resource will render the resource entirely replaceable. This would typically never be available in the case of actions affecting resources that possess non-monetary values. But if a consumable resource such as a mineral or other resource determined to serve only utilitarian values became obsolete, then preserving a stock of the resource for future generations would no longer be required.

3. Transparency/Information Dissemination

Ecologists have also suggested that broad sharing of information can contribute to adaptive learning.[66] By dispersing information to a wide array of potential users, a system is more likely to create variation from which all can learn. For example, if a state agency could use data collected under the Legacy Act about resources within its boundaries, the state might act on the information in a way that generated further experimentation and opportunities for adaptive learning. The Legacy Act can and should be designed to ensure that the information collected by the relevant agencies is accessible to a wide array of users, including the public, and state and local governments.

4. Employing the Best Scientific and Analytic Tools

Ecologists and others have also developed and demonstrated the value of a wide array of tools that help us predict the impacts of various activities on natural systems.[67] The Legacy Act should build on this knowledge and require agencies to utilize the best tools available in their planning under the Act. This would include use of simulations, proxies, scenario building, and GIS as tools to aid in monitoring and planning.[68] The Act should include a mandate for a Committee of

65. *See* Holly Doremus, *Precaution, Science and Learning While Doing in Natural Resource Management*, 82 WASH. L. REV. 547, 550 (2007) (advocating a precautionary approach that incorporates adaptive learning); Ruhl, *supra* note 6, at 1252 (describing adaptive management as requiring "institutionalization of monitoring-adjustment frameworks that allow incremental policy and decision adjustments at the post-regulatory 'back end'")

66. Davidson & Geu, *supra* note 61, at 877.

67. Gunderson, *supra* note 6; J.B. Ruhl, *Sustainable Development: A Five-Dimensional Algorithm for Environmental Law*, 18 STAN. ENVTL. L.J. 31, 59–62 (discussing use of GIS and scenario building).

68. Ruhl, *supra* note 67. For further sources discussing some of these tools, see Flournoy et al., *supra* note 2, at 1592–95; *see also* Davidson & Geu, *supra* note 61,

Scientists, similar to that created under the NFMA, to assist the agencies in developing metrics and regulations.[69] This would ensure that the agencies benefit from the best available thinking on the tools for evaluating and predicting the status of public natural resources.

B. Areas of Tension Between the Legacy Act and Ecological Insights

Notwithstanding these elements of the Legacy Act that appear to be compatible with the insights of ecology, fundamental tensions remain that require attention.

1. Enforceability v. Flexibility

The most fundamental tension between the Legacy Act and what ecology has taught us is that the Legacy Act seeks to draw a specific line in the sand. It seeks to preserve a defined quantity and quality of natural resources. This flies in the face of a fundamental lesson from ecology: natural systems and the resources that form these systems are dynamic. They change over time even if there is no human intervention, and they may change in the future as a result of human activities already taken.[70] This change may be minimal and gradual, or it may be sudden and dramatic. In the case of events like storms, hurricanes, and floods, the change to the systems and the values and services they provide can be enormous.[71] Whether large or small, sudden or gradual, the important point is that natural processes and past human conduct can and do affect the quantity and quality of available resources.

Thus, the Legacy Act can be critiqued as seeking to preserve a quality and quantity of resources in natural systems as though they were frozen at one moment in time. This raises the following question: how can we aspire to preserve a specified quantity and quality of

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at 877 (describing and commenting "on the management alternatives in the [Revised Draft Environmental Impact Statement, Master Water Control Manual, Missouri River] as refined by the newly published National Academy of Sciences project and [assessing] those alternatives in the context of the eco-regulatory political history of the Missouri River and the new science of complex adaptive systems theory").

69. 16 U.S.C. § 1604(h) (2006).

70. Future changes in the climate that will result from past emissions of greenhouse gases are the most vivid example of this.

71. Human conduct can of course contribute to the magnitude and reach of these events. For example, human efforts to contain the Mississippi River have produced a legacy of undesirable impacts. *See, e.g.*, Christine A. Klein & Sandra B. Zellmer, *Mississippi River Stories: Lessons from a Century of Unnatural Disasters*, 60 SMU L. REV. 1471 (2007). In Part III *supra*, I discuss how the Legacy Act could be applied to discourage the human activities that exacerbate the adverse impacts of this type of natural event.

resources if the resources themselves are changing? The answer lies in considering not just the goal of the Legacy Act but how it seeks to accomplish that goal.

The Act seeks to preserve a legacy of resources by requiring agencies to adopt a precautionary approach, and to prevent *human* conduct that is inconsistent with the act going forward. Thus, the Act accomplishes its goal by ensuring that neither the agencies themselves nor others impermissibly degrade or deplete the resources in question. Fixed baselines and a clearly defined legacy play an important role in achieving the goal but the focus is on regulating voluntary human conduct. Nonetheless, a fixed baseline and a defined legacy are critical components. Experience under management statutes that lack a fixed baseline has proven that they are poorly suited for controlling human conduct in service of preserving a legacy. In addition, without a clear and enforceable standard, transparency and accountability may be impaired. If there are no fixed standards, it is more difficult to assess when degradation or depletion should be prohibited and when it should be permitted. Transparency and ease of enforcement are important attributes. Therefore, a clear line in the sand—a defined legacy of resources—is desirable. Fixed baselines and clear standards are appropriate tools to guide and constrain human activity that occurs after the date on which the prohibitions of the Act enter into force.

However the problem of changing natural systems highlights that the Legacy Act must account for two sources of degradation or depletion other than post-Legacy Act human conduct—namely, change that is either (1) not caused by human activity, or (2) caused by human activity that predates the Legacy Act. The first type of change refers to an inherent aspect of natural systems and is inevitable. The second type includes changes in natural systems wrought by the activities already taken prior to the adoption of a Legacy Act. This would include past activities that will contribute to climate change and its attendant effects. It is clear that past human activities—including those that have produced greenhouse gases—have already set in motion processes that will produce serious degradation and depletion of resources in the future.

In order to be effective, the Legacy Act should allow for, and accommodate, both of these types of change. The Legacy Act's primary goal is to eliminate intentional human activity[72] that leads to depletion or degradation of a defined public natural resource legacy. The use of a fixed baseline of resources is merely a tool to achieve that end. What we know of natural systems suggests that rigidly seeking to preserve a

72. By intentional human activity, I refer to human actions that are taken as a result of intention, not that the effects of the activity are necessarily intended.

fixed legacy of resources, whatever the cause of the change would be a commitment with potentially exorbitant costs and, in some cases, limited benefits. For example, in the aftermath of a hurricane, it would demand that natural resource managers work to restore the resources to their pre-hurricane condition.

Therefore, it seems clear that the Legacy Act must incorporate adequate flexibility to allow for the two types of change described above and to permit the resource baseline and legacy to shift to reflect these types of change. However, the challenge is to devise a path that avoids the perils of both a blank check approach that would allow agencies to rewrite their goals whenever the natural system changes and an overly rigid framework that seeks to freeze our natural resources in time.

Resilience may offer a useful concept to permit us to chart this course. Resilience assesses the capacity of a natural system to retain its behavior regime following a disturbance and helps identify the point at which the system will flip into a new behavior regime. One way to address degradation or depletion resulting from changes that are not caused by human activity would be to incorporate some measure of resilience as an *alternative* standard to be applied in cases where the system has changed and the change is not attributable to human conduct.

How might this work? Section 1 of the statute would still articulate a goal of preserving a defined legacy (in the illustration, the goal would remain preserving the same quantity or quality of resources as we have today). And the prohibition in section 3 would remain the same (no actions that will degrade or deplete public natural resources are permitted). However, the affirmative duty imposed on the agency in section 7—the provision that mandates that the agency *ensure* that no degradation or depletion occurs—would be modified. Section 7 could provide for an *alternative* duty that would apply in cases in which degradation or depletion does not result from human activity or results from human activity taken prior to the adoption of the Act.

In such cases, the agency would perform a resilience assessment on the relevant natural systems to determine whether they have achieved a different behavior regime or whether they retain the capacity to persist. In the latter case, the agency would be required to modify its legacy plan as needed to promote the continued resilience of the system. However, in cases where a system has flipped to a new regime, the question of the proper goals to govern planning would require further public input. The very question of whether to attempt to restore a system to its prior state or to shift baselines should be the subject of public comment and a decision by the stewardship agency, subject to judicial review. Factors to be considered would include the values and services provided by the resource in its prior state, the val-

ues and services provided by the resource in its current state, the uniqueness of the resource, and the cost of restoring the resource to its prior behavior regime.

Section 9 would also need to account for shifting baselines in those cases where the changes in baselines are changes to the resource not caused by human activity. In this situation, the baselines to be used in legacy plans and in determining compliance with the Act should reflect the changed conditions.

This same approach would be appropriate to address degradation that is caused by pre-Legacy Act human activity. The predictions of migrating ecosystems and widespread impacts from climate change suggest that we must be prepared to allow baselines to shift as ecosystems shift. As a practical matter, it may be impossible to sustain ecosystems in their current state as the climate changes, and we currently have no way to assess the potential costs of trying to reverse the impacts of greenhouse gases we have already released. Creative technologies to mitigate the impact of these gases are being explored, but the cost, feasibility, and desirability of these approaches remain open questions.

The question of whether to seek to prevent (or reverse) change to ecosystems brought on by past contributions to climate change is an extremely important policy question that would be better addressed when the scope and dimensions of the problem become clearer. However, as a default, the Legacy Act should be drafted to treat depletion or degradation caused by pre-Legacy Act human activity in the same way that it treats depletion or degradation that is not caused by human activity. Thus, adaptive planning under the Legacy Act should take into account changes that result from pre-Legacy Act human activity and allow the baselines of resources to shift to reflect these changes. Decisions on whether to undertake restoration in response to the effects of pre-Legacy Act human activity should be made with public notice and participation, considering factors similar to those noted above.

By incorporating resilience in this way, the Act would maintain a clear, enforceable standard to guide human conduct going forward, but it would also provide agencies with appropriate flexibility to acknowledge and account for changes in natural systems that the Act cannot prevent.

2. *Ecosystems v. Resource Quality and Quantity*

Another potential problem is the Legacy Act's focus on resource quality and quantity. Ecology reminds us that these resources are part of complex natural systems. In some cases, assuring that the existing quantity of one resource remains stable may not tend to promote the resilience of the system. Or assuring the quantity of one

resource may guarantee the depletion of another. As sketched above, section 3 of the statute requires that Congress must articulate a maximum degree of degradation permitted for individual resources. However, for biological, as opposed to mineral resources, preserving the ecosystem on which the resources depend may be a more important goal than preserving a precise quality and quantity of resources. Collecting data on and preserving the individual resources—whether a particular species of tree or the quality of a stream—and the services and values they provide remain important components of the Act. But to be ecologically sound, the Act must also preserve functioning ecosystems. Management decisions that focus on preserving individual resources may not be optimal for preserving the ecosystem as a whole. Thus, the dilemma is that preserving individual resources may not always be the right decision and preserving an ecosystem is an imprecise goal and one for which setting metrics would be challenging.

Resilience again may offer a way to negotiate this tension. The Act should still require preservation of the quantity and quality of individual resources that comprise the legacy. However, the statute could also impose an overriding mandate that agencies not permit activities that will cause an ecosystem to lose its resilience.[73] Thus an agency would have authority to undertake or permit activities that might cause some degradation or depletion of a resource if that activity was necessary to maintain the ecosystem's resilience and to prevent the ecosystem from flipping into a new behavior regime. And the agency would not have authority to undertake or permit activities that would cause an ecosystem to lose its resilience completely. Similarly, in drafting a legacy plan, an agency would be permitted to deviate from the goal of retaining precisely the same quantity or quality of a given resource if it could document that the deviation was needed to preserve resilience of the natural system. And in assessing the legality of actions under the statute, again, promoting resilience might offer an alternative basis for claiming compliance for an activity that depleted or degraded a particular resource.

The challenges and risks of incorporating such a broad exception are considerable. First, the techniques for measuring resilience of natural systems are still evolving and demand vast amounts of information. The demand for information poses an obstacle to use of such an exception. However, given that the burden of proof would fall on the agency or other actor to prove that a given action is needed to promote resilience, the greater risk is that the agency would be unable to prove the need for the exception rather than that it would be used

73. This seems consistent with Gunderson's suggestion that we shift focus from "variables of the moment," like water levels and population numbers, to "more enduring system properties such as resilience, adaptive capacity and renewal capability." Gunderson, *supra* note 6, at 7.

excessively. The real value of including such a standard is that it would focus resource managers on the range of acceptable conditions needed to sustain the broader ecosystem. Less likely to be used as a precise guide for particular decisions, it focuses resource managers on the range within which they can make decisions without losing the resources, values, and services associated with the ecosystem. Moreover the focus on resilience might provide a better focus for managers even regarding individual resources.[74]

A second possible critique of incorporating reliance is the complexity of the concept and the data and analysis required to assess the impacts of a given activity on resilience. Because the techniques are still evolving and are extremely complex and information intensive, it would be difficult for the public and courts to evaluate claims based on resilience. However, in light of the importance of maintaining a focus on ecosystems and not just individual resources, this may be a necessary cost.

3. Uncertainty and Surprise

Another area in which the Legacy Act proposal stands in tension with ecology is that it relies heavily on planning that seeks to predict the state of natural systems in the future. The Legacy Act not only demands that agencies develop plans, but the agencies also are charged to ensure outcomes consistent with the plans. There is universal agreement on the uncertainty that attends our efforts to predict natural systems' behavior and the vast amounts of data that such predictions require. And the Legacy Act's effort to promote planning over a longer time horizon further increases the uncertainty associated with predictions and the likelihood of surprise. The statute places a premium on the agency predicting how various activities will affect resource quality and quantity. But it is inevitable that many of these predictions will prove wrong. One answer to this is that the proposed exception in section 7 for change not caused by human conduct helps to alleviate the pressure on agencies to predict nonhuman-induced change in ecosystems.

A further answer to this tension in the statute's design is the incorporation of the precautionary principle. By creating an absolute prohibition, placing the burden on the agency to ensure compliance, and triggering the prohibition upon proof that an action *may* violate the standard, the statute was intentionally created with an incentive for the agency to err on the side of precaution. Thus, although uncertainty exists, the agency has the incentive to make decisions that will lead it towards compliance. Over time, as it monitors the resources and learns from experience, it can adjust its plans and actions to cor-

74. *See* Allen et al., *supra* note 64.

rect for any overly conservative decisions. Nevertheless, this is not a complete answer. A key challenge in further development of a statute is to ensure that the Act does not impose unrealistic information and planning demands.[75]

VI. CONCLUSION

The Legacy Act offers an illustration of the tensions that bedevil efforts to design laws that are enforceable and yet ecologically sound. Although not a panacea, resilience holds promise as a concept that enables us to mediate these tensions. As initially conceived, the Legacy Act addressed the concerns associated with legal critiques of natural resource management laws but overlooked some critiques from an ecological perspective. By incorporating resilience into the design of the Legacy Act as described in Part V above, the statute better accounts for uncertainty, change and surprise in natural systems, and the critical linkage between preserving individual resources and protecting ecosystems. Such a statute ultimately provides a better balance between the competing imperatives of flexibility and enforceability.

75. *See supra* text accompanying note 69 (suggesting a blue ribbon panel, analogous to the Committee of Scientists convened under the National Forest Management Act to address questions of this type).